

2.1 Videos Guide

2.1a

Definition: (derivative)

- The derivative of a function f at a is $f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$, provided the limit exists.
- Alternative form of the derivative of f at a
 - $f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$
- Equation of a tangent line at $(a, f(a))$
 - $y - f(a) = f'(a)(x - a)$

Exercises:

- Find the equation of the tangent line to the curve at the given point.
 - $y = x^3 - 3x + 1$, $(2, 3)$

2.1b

- $y = \frac{2x+1}{x+2}$, $(1, 1)$
- The limit represents the derivative of some function f at some number a . Give the function f and number a .

$$\lim_{x \rightarrow 1/4} \frac{\frac{1}{x} - 4}{x - \frac{1}{4}}$$

- Find $f'(a)$.

$$f(x) = \frac{4}{\sqrt{1-x}}$$

2.1c

- The displacement (in feet) of a particle moving in a straight line is given by $s = \frac{1}{2}t^2 - 6t + 23$, where t is measured in seconds.
 - Find the average velocity over each time interval:
 - $[4, 8]$
 - $[6, 8]$
 - $[8, 10]$
 - $[8, 12]$
 - Find the instantaneous velocity when $t = 8$.
 - Draw the graph of s as a function of t and draw the secant lines whose slopes are the average velocities in part (a). Then draw the tangent line whose slope is the instantaneous velocity in part (b).